

CLAIMS

1. A coil apparatus comprising: a core; a winding; and a terminal,

5 wherein the core has terminal attachment portions at opposed both ends thereof, and has a winding portion in an intermediate portion thereof,

the winding is wound around the winding portion,

10 the terminal is a part to which an end of the winding is connected, formed of one metal sheet, and includes an attachment portion, an intermediate portion and a bottom portion,

one end of the attachment portion is fixed to the terminal attachment portion of the core,

15 one end of the intermediate portion is continuous with the other end of the attachment portion at a bent portion,

20 the bottom portion has one end which is continuous with the other end of the intermediate portion at a bent portion, faces the attachment portion, and has the other end as a free end, and

the intermediate portion has a hole in a plane thereof, both inner edges of the hole opposed to each other in at least one direction having an arc shape.

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2. The coil apparatus according to claim 1, wherein the hole is arranged to be biased in a direction of the

attachment portion.

3. The coil apparatus according to claim 1, wherein
the terminal has an extended width portion in which a width
5 is extended from the intermediate portion toward the bottom
portion between the intermediate portion and the bottom
portion.

4. The coil apparatus according to one of claims 1
10 to 3, wherein the hole has a circular shape.

5. The coil apparatus according to one of claims 1
to 3, wherein the hole has a short diameter and a long
diameter, and a direction of the short diameter matches
15 with a direction from the attachment portion to the bottom
portion.

6. The coil apparatus according to one of claims 1
to 3, wherein the hole has a short diameter and a long
20 diameter, and a direction of the long diameter matches with
a direction from the attachment portion to the bottom
portion.

7. The coil apparatus according to claim 5 or 6,
25 wherein arc-shaped parts at both ends of the hole are
continuous with each other through linear parts.

8. The coil apparatus according to claim 5 or 6,
wherein the hole has an elliptic shape.

9. The coil apparatus according to claim 1, further
5 comprising an insulating sheath body,

wherein the insulating sheath body covers the core
and a coil provided around the core,

the core includes a winding core portion constituted
of the winding portion and a pair of flange portions formed
10 at both ends of the winding core portion, and

a cross section of the winding core portion
orthogonal to a winding axis direction has a shape which
includes bulge portions on a pair of opposed surfaces in a
square shape.

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10. The coil apparatus according to claim 9, wherein
the bulge portion of the winding core portion is formed of
a curved line in the cross section orthogonal to the coil
winding axis direction.

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11. The coil apparatus according to claim 9 or 10,
wherein at least one winding escape portion is formed in
the winding core portion,

the winding escape portion is formed by being
25 inwardly depressed apart from an arc line which is in
contact with the bulge portion and connects the square
angular portions on both sides of the bulge portion as seen

in a lateral cross section of the winding core portion.

12. The coil apparatus according to one of claims 9
to 11, wherein the winding core portion has flat portions
5 on both sides of each of the bulge portions, and

the flat portions are formed between the other pair
of opposed surfaces in the square shape and the bulge
portions.

10 13. The coil apparatus according to one of claims 9
to 12, wherein a part between an outer peripheral surface
of the winding core portion and a surface of the flange
portion on the winding core portion side is subjected to R
processing or taper machining.

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14. The coil apparatus according to one of claims 9
to 13, wherein a part between a surface on the winding core
portion side and an outer peripheral surface on a radial
outer side in the flange portion is subjected to R
20 processing.

15. The coil apparatus according to claim 1, further
comprising an insulating covering body,

wherein the core includes a coil winding portion, the
25 coil winding portion extending in a longitudinal direction,
the winding is wound around the coil winding portion
to constitute a coil,

the insulating covering body is formed of a thermoplastic insulating resin and covers the core and the coil, and

the core and the coil are positioned at a
5 substantially central part of the insulating covering body.

16. The coil apparatus according to claim 15,
wherein the insulating covering body is formed of a liquid crystal polymer.

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17. The coil apparatus according to claim 1, further comprising an insulating resin sheath body,

wherein the core is a rod-like body extending in one direction and has the winding portion in an intermediate
15 portion thereof,

the winding is wound around the winding portion,

the insulating resin sheath body covers at least a part of the winding,

at least one of the bent portions of the terminal is
20 provided outside the insulating resin sheath body, and

at least a part of a surface of the insulating resin sheath body is roughened.

18. The coil apparatus according to claim 1, wherein
25 the winding is wound around the winding portion to constitute a coil,

the coil includes at least a first coil portion and a

second coil portion, and

a boundary end surface of the first coil portion on
the second coil portion side is inclined in such a manner
that its inner peripheral side is closer to the second coil
5 portion than its outer peripheral side.

19. The coil apparatus according to claim 18,
wherein a boundary end surface of the second coil portion
on the first coil portion side is inclined in such a manner
10 that its outer peripheral side is closer to the first coil
portion than its inner peripheral side.

20. The coil apparatus according to one of claims 1
to 19, wherein the coil apparatus is an antenna, a choke
15 coil or an inductor.